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WASTE MANAGEMENT

Technical Field

This invention relates to a waste management system and apparatus for use in a waste management system.

The invention is primarily, but not exclusively, concerned with domestic waste, that is to say waste generated in a domestic dwelling house. However the system can be used in relation to trade and commercially generated waste of the kind which is currently handled by Local Authority waste collection services in conjunction with the collection of domestic waste.

Background of the Invention

Currently the majority of domestic waste is treated as disposable material and is collected in bulk and disposed of by landfill. Facilities exist in various locations for the householder to deposit bottles and the like for recycling, but in general household waste is treated as a single waste product and goes to landfill with no consideration of recycling.

There is a growing pressure, driven at least in part by legislation, to divert waste from landfill, for disposal by other means, and to increase recycling rates of waste material. Diverted material is defined as material which is handled other than by disposal in landfill, and includes material disposed of by, for example, incineration. However, diverted material also includes material which is to be recycled (recyclate), recyclate being defined as material discarded by the householder, not destroyed but instead reclaimed for further use to be reprocessed for recycling. Two interrelated problems

which hinder both (a) the increasing diversion of waste material from disposal by landfill and (b) the available quantity and quality of recyclate, are firstly the economics of handling waste material using current waste collection methods, and secondly the resistance of the householder to sort waste material into different categories. It is an object of the present invention to provide a waste management system, and apparatus for use in such a system whereby the aforementioned problems are minimised or obviated.

Disclosure of the Invention

In accordance with a first aspect of the present invention there is provided a waste management system comprising providing householders with waste collection units having predetermined collection containers for predetermined categories of waste whereby the householder performs a preliminary sorting of his waste into said predetermined categories, providing a household collection vehicle having collection containers for at least the waste categories sorted by the householder, providing a way-station at which categorised waste from the collection vehicle can be temporarily stored, providing a way-station collection vehicle having the facility to transport said categorised waste from a plurality of way-stations, and providing a recycling depot at which categorised waste from said way-station collection vehicle can be distributed for recycling or disposal.

Preferably the household collection vehicle has storage compartments for more categories of waste than the household collection unit, and the household collection vehicle operator performs a secondary sorting of the material first categorised by the householder.

Preferably the ratio of the sizes of the containers of the household collection unit corresponds to the ratio of the volumes of the different categories of waste which are expected in the overall waste of a household.

Preferably the ratio of the sizes of the various collection compartments of the household collection vehicle is in accordance with the volumes of the individual categories of waste sorted by the combined effort of the householder and the collection vehicle operator.

Preferably the household collection vehicle is provided with compaction means for reducing the volume of low density waste items such as cans or plastics bottles.

Preferably the recycling depot incorporates an anaerobic digester or a closed in-vessel composting system for recycling putrescible and organic waste materials.

In accordance with a second aspect of the present invention there is provided a household waste collection unit comprising a frame supporting a plurality of moveable waste boxes for designated categories of waste, said boxes being detachable from the frame and having a ratio of sizes one to another which corresponds to the ratio of volumes of said predetermined categories of waste within the overall waste generated by the household.

Preferably each of said boxes is equipped with a detachable lid.

Conveniently there are five boxes, consisting of two large boxes of equal volume, a medium sized box of lower volume, and two smaller sized boxes of equal smaller volume than the volume of the medium sized box.

Preferably the two smaller sized boxes are contained within the two large sized boxes respectively.

Desirably one or both small sized boxes is equipped with clip means for holding a biodegradable liner in an open condition in the box.

In accordance with a further aspect of the present invention there is provided a household collection vehicle (HCV) incorporating a plurality of containers at least equal in number to the number of separate categories of waste to be collected from a household.

Preferably said containers of said HCV are demountable from the HCV as a unit.

Preferably said HCV includes a compaction arrangement whereby low density waste items such as cans and plastic bottles can be compacted before storage in collection containers of the HCV.

The invention still further resides in a waste management system as defined above utilising a collection unit as defined above and a household collection vehicle as defined above.

The invention still further resides in a compactor for waste plastics materials comprising a chamber for receiving plastics materials, ram means for

reducing the volume of said chamber to compact materials therein, and characterised by heater means for heating plastics materials to a softening temperature prior to operation of said ram means.

Preferably said softening temperature is chosen in relation to the probable types of plastics material in the waste to be processed, such that the materials can be compacted but are not melted and so remain separable as individual items after compacting.

The invention still further resides in a compactor for waste metal cans comprising a chamber for receiving cans, ram means for reducing the volume of said chamber to compact cans therein, and characterised by said ram means reducing the chamber volume to about one fifth of its rest volume when compacting.

Brief Description of the Drawings

One example of the present invention will now be described with reference to the accompanying drawings wherein:-

Figure 1 is a front elevational view of a container unit disposed within a kitchen unit of a domestic dwelling;

Figure 2 is a side elevational view of the unit of Figure 1 with the kitchen unit omitted for clarity;

Figure 3 is a front elevational view of the unit of Figure 2;

Figure 4 is a similar to Figure 2 but illustrating the containers in cross-section;

Figure 5 is a plan view of the uppermost container of Figures 1 to 4;

Figure 6 is a diagrammatic view, to a reduced scale, of a container housed within the upper container of Figures 1to4;

Figure 7 is a plan view of a cover member for engagement with the container of Figure 6;

Figure 8 is a diagrammatic side elevational view of a pedestrian controlled vehicle;

Figure 9 is a front elevational view of the vehicle of Figure 8;

Figure 10 is an end elevational view of the vehicle of Figure 8;

Figure 11 is a plan view of the vehicle of Figure 8;

Figure 12 is a diagrammatic side elevational view of the stillage assembly of Figure 8;

Figure 13 is a rear elevational view of the stillage of Figure 12; and,

Figure 14 is a diagrammatic flow chart of a waste management system using the apparatus of Figures 1 to 13.

Preferred Mode of Carrying Out the Invention

Research indicates that domestic waste generated in one week by a family of four amounts to around 15 kilogrammes and is made up of putrescible/organic materials (P/OM) of approximately 6.9 kg, paper and card amounting to approximately 4.8 kg, glass amounting to 1.65 kg, food and drink cans totalling 0.6 kg, plastics materials totalling 0.9 kg, and hazardous materials amounting to 0.15 kg. It is believed that the waste management system disclosed herein will permit 100% diversion of domestic waste from landfill with the possibility of 94% of the waste being recycled, and 6% currently being disposed of through other routes. Considering the above breakdown volumetrically suggests relative volume unit ratios of 9 P/OM, 41 bottles and cans, 25 paper and card, 9 hazardous materials, and, 41 plastics materials.

A key factor in recycling domestic waste is sorting the domestic waste into individual recyclable categories. For example, the concept of the householder separating glass products such as glass bottles from the domestic waste, and diverting them to recycle bins is now reasonably well accepted. It is believed however that if the householder has the facility for, and an incentive to, separate waste into a much larger group of categories then the householder will do this. Thus in accordance with the present invention the householder is provided with a collection unit as illustrated in Figures 1 to 5 of the accompanying drawings. In a preferred form the collection unit is intended to be housed within the kitchen of the house, conveniently beneath a conventional work surface 9 (Figure 1) and within a conventional kitchen cabinet 10. If desired the cabinet 10 may be closed by a conventional door so that the collection unit is obscured except when in use. Equally the collection unit may be used as free standing furniture, conveniently adapted as a work table in kitchens having no fitted units according to the preference of the user, or placed at a common access place in houses of multiple occupancy, or even placed outside when the weather proofing provisions of the outer skin 11e, 11f and 11g are provided. The collection unit may consist of a pressed sheet metal frame 11 which may be fabricated from metal strip pressings, but conveniently is formed from steel or aluminium sheet pressings as illustrated in Figures 1 to 5. The frame consists of two opposite side pressings 11a, 11b which are substantially mirror images of one another, and which are secured together at their lower edges by a base pressing 11c and at their upper edges by a top pressing 11d. The base pressing 11c has screw adjustable feet 12 for adjusting the height of the unit. It will be understood however that if desired the feet 12 could be replaced by rollers or castors so

that if necessary the whole unit can be moved or extracted from the cabinet 10 with ease.

The exact construction of the frame is not of importance to the invention, and for example at least the two side pressings 11a, 11b can be supplemented with outer cladding 11e, 11f, 11g and a door (not shown) as a weather proof exterior unit where appropriate. Moreover, such a double-skinned construction would produce a more aesthetically pleasing appearance where a collection unit is to be free-standing, not within a cabinet 10. Alternative cladding may be provided with timber and other materials to make an indoor unit compatible with the taste of the householder. Though fabrication as described is preferable, the collection unit may be made from other materials providing that the general arrangement of rails may engage the box rollers 16 and support the frame rollers 19 described below. This would include for example a steel box section structure or timber sides 11a and 11b and attached rails 17 or fabrication of similar forms from thermoset plastics, providing that any extra thickness in the materials still enabled sufficient room to be provided for storage of the lids 24 either above or below the boxes.

The frame 11 slidably supports three collection boxes 13, 14, 15 which are positioned one above the other within the frame. The collection boxes may be made from synthetic resin, moulded chipboard or metal, either as a single moulding or as extrusions or pressings for secondary assembly, or cut from wooden panels. Each of the collection boxes 13, 14, 15 is provided externally, on its opposite side faces, with rollers 16 which co-operate with respective roller tracks 17 pressed into or attached to the material of the sides of the frame 11. It can be seen that the rollers 16 are positioned on their

respective collection boxes adjacent the front and rear ends of the lower edges of the opposite side walls of the boxes. Around their open upper face each of the boxes 13, 14, 15 is formed with an integral, peripheral, outwardly extending lip 13a, 14a, 15a respectively. Immediately beneath each of the lips the frame 11 carries respective rollers 19 upon which the lips seat, so that the rollers 16, 19 permit each of the boxes to be moved smoothly and easily from a stowed position to an outwardly projecting position in which material can be deposited into the boxes, and from which the boxes can be lifted out of the frame.

While the boxes 13, 14, 15 have the same dimensions in plan view, it can be seen that the boxes 13, 15 are of identical depth, and therefore capacity, but the box 14 is of reduced depth by comparison with the boxes 13 and 15. As can be seen in Figure 4, a first smaller box 21 is seated within the box 13, and a second, similar smaller box 22 is seated within the box 15. It can be seen from Figure 4 that not only are the boxes 21, 22 shallower than the boxes 13, 15, they also are significantly shorter, but only fractionally narrower than the boxes 13, 15. At its free edge each of the boxes 21, 22 has an integral, outwardly extending peripheral lip 21a, 22a and around three sides of the boxes 21, 22 their lips 21a, 22a are received in corresponding recesses in the lips 13a, 15a of the boxes 13, 15. Thus the boxes 21, 22 are supported by the boxes 13, 15 and move therewith, although when the boxes 13, 15 are in an open position then the boxes 21, 22 can be lifted out of their respective larger box.

Each of the boxes 21, 22 is equipped with a spring clip 23 (Figures 5 and 6) which can seat within the open end of the box and can hold a respective

biodegradable liner bag in an open position so that material dropped into the box 21 or 22 is collected within the respective bag.

Preferably the upper wall 11d of the frame 11 is double-skinned, the upper and lower skins being spaced apart to define a compartment within which moulded synthetic resin box lids 24 can be stored. There are three substantially identical lids 24 for closing the boxes 13, 14 and 15 respectively. It will be recognised that as the box 21 is within the box 13 and the box 22 is within the box 15 then a lid engaged with the box 13 and box 15 will also close the respective box 21 or 22. As is apparent from Figures 1 and 7 each of the lids 24 comprises a generally planar, rectangular sheet equal in size to the plan dimensions of the boxes 13, 14, 15 and having, at its opposite longitudinal edges, in-turned flanges 25. Each lid 24 is engaged with a respective box by inserting the respective box lip into the mutually presented channels defined by the in-turned flanges 25, and then sliding the lid along the length of the box to a position in which the lid closes the open end of the box. If desired corresponding projection and recess detent arrangements can be provided on the lid and the box lip to resist movement of the lid relative to its respective box to its closed position, although generally this will not be necessary since there will be sufficient friction between the in-turned flanges 25 and the box lip to resist unintentional movement of the lid to open the box.

When the collection unit is installed in a kitchen the householder will be instructed to deposit specific waste material types in specific boxes. Thus the box 13 will be intended to receive plastics materials, for example plastics bottles and food containers, the box 14 will receive paper and card, the box 15 will receive glass bottles and cans, the box 21 will receive small

hazardous waste materials, and the box 22 will receive putrescibles and organic materials. The dimensions of the boxes have been selected in accordance with the anticipated volumes of the relevant waste materials generated in one week by a domestic household consisting of four persons. Thus for one representative class of household the following box volumes are appropriate :-

Box 13	50 litres
Box 14	25 litres
Box 15	50 litres
Box 21	9 litres
Box 22	9 litres

As boxes 21 and 22 are housed in boxes 13 and 15 respectively the effective volume of each of boxes 13 and 15 is 41 litres.

Putrescibles will include vegetable peelings and other food waste, and it will be understood that when the container unit is positioned beneath a work surface then provided that the box 13 is pulled out sufficiently far such materials can be swept directly from the work surface into the biodegradable liner contained within the box 21. It is part of the waste management system that the boxes will be emptied on a weekly basis by a collection service. In the event that materials in the liner of the box 22 become offensive before the next collection is due then it is a simple matter for the householder to release the clip 23 of the box 21, to fold the liner closed, and to insert a further liner on top of the existing, now closed, liner, the new liner being held in an open condition by the clip 23. By the end of the week therefore there may be several liners stacked one on top of the other in the box 22.

On a designated collection day the householder will remove each of the boxes 13, 14, 15 together with the internal boxes 21, 22, from the frame 11 and will close the boxes 13, 14, 15 with respective lids 24. Thereafter, the householder will carry the boxes to a point external to the house, at which they can be collected by a collection service. Ideally the boxes and/or the lids 24 will be equipped with handles to facilitate the householder carrying the closed boxes from the interior of the house to the collection point.

Figures 8 to 13 illustrate a household collection vehicle 31 (HCV) in accordance with the present invention. The collection vehicle 31 may be a pedestrian controlled vehicle as shown, conveniently electrically driven, but for safety reasons, particularly in rural applications a ride-on vehicle of similar size having a control cab for the operator is preferred. It will be recognised that while a battery powered vehicle is preferred other motive fuel arrangements can be selected, including, LPG, Diesel, Bio-Diesel and Ethanol. It is intended that the vehicle 31 will be controlled by a single operator who will have a pre-designated collection round, and will be known to the householders in that round. The HCV 31 is designed to carry a maximum load of 1,500 kg. It is anticipated that in the majority of regions the operator will be able to collect from 200 households per day, and since each household is expected to generate around 15 kg of waste it can be seen that the target of 200 households per day would need to be split into three rounds each of 66 - 67 households if the HCV is to be kept within an intended maximum 1,000 kg of recyclate and residual material plus the weight of its demountable stillage assembly 36 within the operating load of 1,500 kg.

The HCV has a base unit 32 having rear wheels 33 and steerable front wheels 34, steerable by a tiller bar 35 where the vehicle is pedestrian controlled as shown in the drawings. The base 32 will carry an electric motor or motors for driving one or both sets of wheels, and the base carries batteries for providing the motive power capable of driving the HCV up an incline of 35% under load. Control mechanisms will be provided in the cab as usual, or on the tiller 35 for energising and de-energising the drive motor, and the controls will include a "dead man's handle" arrangement whereby electrical power to the or each drive motor will be disrupted in the event of the operator loosing the controls. Supported on the base 32 is a de-mountable stillage assembly 36 comprising a plurality of plastic or sheet metal containers 38, 39,40, 41, 42 and 43 carried by a fabricated steel or aluminium chassis 37. The metal chassis 37 has extensible legs 37a whereby the stillage assembly 36 may be supported from the ground, to allow the base unit 32 to be driven from beneath the stillage assembly, leaving the stillage assembly free-standing.

Immediately in front of the stillage assembly 36 the HCV includes a compactor assembly 44 which is divided into three compartments each of which is served by a respective crushing/compacting ram arrangement (not shown) although it will be understood that in some applications it may be possible for a single common ram arrangement to serve more than one compacting compartment. One of the compartments has a heater the purpose of which will be explained in more detail hereinafter.

The container 38 of the stillage assembly 36 is intended to receive plastics materials. The container 39 is intended to receive food cans, the container 40 is intended to receive drinks cans, the container 41 is intended to receive

paper and card, the container 42 is intended to receive glass, and is sub-divided internally into three separate compartments each having its own entrance so that the glass can be divided into clear glass, green glass, and brown glass. Lastly, the container 43 is in the form of a metal or synthetic resin box seated on a roller bed 43a forming part of the stillage frame. The roller bed allows the container to be rolled outwardly to one side or the other of the HCV so that the open top of the container protrudes beyond the container 42. The container 43 is intended for putrescibles/organic materials.

The HCV operator arrives at the household on the appointed day, and retrieves the three boxes 13, 14, 15 which are by this time placed outside the house. The operator removes the lids of the boxes, and sorts the glass from the box 15 into the various compartments of the container 42. He then places large cans, generally food cans in the first compartment of the compactor 44, and drinks cans from the box 15 in the second compartment of the compactor. He then places plastics waste from the box 13 into the heated compartment of the compactor 44 and after about 45 seconds during which the plastics waste is heated to about 185° C he initiates operation of the compactor so that the food cans are crushed, the drinks cans are crushed, and the heated plastics bottles and the like are compacted down to a much smaller volume, but without destroying the integrity of the plastics materials.

The temperature of the heated compartment of the compactor is so chosen that moulded plastic bottles and the like can be reduced in volume without actually melting the plastics material or causing the plastics materials to fuse together. Desirably the heated compartment is insulated to minimise heat loss and so conserve energy and it may have an air-lock type lid arrangement whereby an outer lid is opened to insert bottles and closure of the outer lid

opens an inner lid allowing the bottles to enter the heated chamber with minimum heat loss. Naturally where the compartments are served by respective ram arrangements they can if desired be separately operated. When the compactor has finished its cycle or cycles, the operator puts the compacted plastics materials into the HCV container 38, the compacted food cans into the HCV container 39, and the compacted drinks cans into the HCV container 40.

It is desirable to compact drinks cans separately from food cans as it is found that compacting the two together results in an entanglement of the compacted cans so severe that the cans form a block and individual ferrous cans cannot be separated from non-ferrous cans magnetically. Moreover it is desirable to compact drinks cans by reducing the compactor compartment volume to about one fifth of the starting volume as this significantly reduces the can volume while ensuring that compacted drinks cans are still sufficiently free of one another to be separable from the compacted mass of cans by magnetic separation techniques

The paper and card box 14 will contain newspaper, periodicals and magazines; white paper (writing paper, letters, office paper and the like); grey card which is, for example, the type of card from which cereal packets are made, and general cardboard such as brown corrugated card. As these are individually recyclable the HCV operator sorts them into four individual compartments provided in the paper and card container 41 of the HCV. The four compartments are positioned one above the other and are separated by hinged horizontal partitions, access to them being gained from the side wall of the stillage assembly. Conveniently a fifth compartment is provided in the container 41 above the four paper and card compartments and this is to

receive composites, for example fruit juice or food containers, formed from foil lined plastic or card.

The HCV operator removes the clip 43 of the container 22 and tips the bagged putrescible materials into the putrescibles container 43 of the HCV.

Lastly, the content of the "hazardous" container 21 will be transferred to a hazardous container of the HCV (not shown). Hazardous materials stored by the householder in the box 21 may include aerosols, disposable lighters, ink and toner cartridges and the like, and may also includes sharps such as razors, and hazardous components such as batteries. Ideally batteries, razors and similar hazardous materials will be stored within the box 21, within a separate, colour coded bag, so that the HCV operator and subsequently staff at the depot can handle sharps and the like safely and are aware of their hazardous nature. As is apparent from the drawings the HCV includes an elongate tubular container 45 which can receive fluorescent tubes and the like which the householder will of course not try to store in the container unit.

It will be recognised that the preliminary sort which has been done by the householder is refined by a secondary sort performed by the HCV operator. Furthermore, it will be recognised that handling of high volume low weight waste such as food and drinks cans and plastics materials is optimised by compacting prior to being carried in the appropriate containers of the HCV.

The householder will receive written instructions with regard to the storage of the domestic waste in the boxes 13, 14, 15, 21 and 22 and should the HCV operator note that a householder is not using the boxes correctly then it will be within the skill of the HCV operator to explain the problems to the

householder. It will be expected for example that the householder will store vacuum cleaner bags, and the contents of non-bag type vacuum cleaners in the P/OM storage together with domestic sweepings, broken crockery, fire ash and the like. However, while wood fire ash is considered to be an organic waste it must be recognised that coal fire ash is treated as a hazardous waste, and should be stored in the box 21. Similarly, while the householder will store composites such as metallic foil backed plastic (for example crisp containers) and plastic laminated card (for example fruit juice cartons) in the paper and card box 14, the HCV operator will separate these when emptying the paper and card box into the multi-compartmented container 41 of the HCV.

The treatment, by the HCV operator, of plastics material is important since the plastics material is readily recyclable. However, the plastics material must be compacted as mentioned above to render it of manageable volume. After compacting each plastics type must be capable of separate processing at a recycling depot which means that the compaction must not fuse or lock individual items together. Plastics materials must however be compressed in a manner which overrides the moulding "memory" of the material as it cannot be stored under compression. The heating element of the heated compartment of the compaction chamber may be powered by the batteries of the HCV and it is believed that an optimum working temperature is 185° C. However to conserve battery power for motive purposes it is preferred to heat the heated compartment of the compaction chamber from a separate fuel source on the vehicle, for example a compressed gas or LPG reservoir. The 185° C "softening" temperature is above the forming temperature of materials such as styrene, but is not sufficiently high to chemically degrade such materials. The temperature is high enough to cause vacuum or pressure

formed plastics containers to revert to their sheet form and to make materials such as polypropylene sufficiently soft to be compacted. Furthermore, at 185° C valuable blow moulded drinks bottles, formed for example from polyethyleneterephthalate (PET) will shrink considerably, and can be compacted to reduce their volume dramatically.

It is anticipated that a cycle time of 45 seconds should be adequate to heat the plastics waste derived from a single household, and to compact that plastics waste together at the same time as compacting the food cans and drinks cans.

The or each hydraulic motor driving the or each hydraulic or screw ram of the compactor will also be driven from the battery of the vehicle and it is anticipated that reducing the volume of this waste to one fifth of its original volume will be adequate. It will be understood the compactor ram or rams can be hydraulic or if desired be screw operated, the screw or screws being driven from the battery of the vehicle through one or more electric motors. Alternatively where the vehicle 31 is driven by a combustion engine rather than electrically the compactor rams could be powered from an engine take-off shaft. Moreover the compactor heater could alternatively be powered by a combustible fuel conveniently compressed or liquefied gas. It will be recognised that a compactor or compactors as described above can be used as stand alone units and could be incorporated in other forms of waste management equipment.

If the P/OM box 22 is contaminated, for example as a result of spilt materials, then the HCV operator has the facility to provide a clean replacement container from a storage compartment (not shown) on the HCV 31. He will then take the dirty container 22 with him for subsequent cleaning

and return. Ideally the HCV will include a small hand washing unit so that the operator can wash any contamination from his hands. However it will be understood that it is within the scope of the invention to provide a more comprehensive washing unit on the HCV whereby if necessary a contaminated box 22 could be washed, sterilised, and then returned to the householder.

After transferring all of the waste from the boxes to the HCV, and replacing a contaminated box 22 if appropriate, the HCV operator returns the boxes with their lids to the location from which he collected them, so that the householder can then return them to the frame 11 of the container unit.

The HCV operator continues his round until he has serviced all of the households for that particular round, and then he returns to a way-station. At the way-station there will be storage, preferably a secure, covered enclosure for the HCV when it is not in use, and an arrangement for charging the batteries of the HCV overnight. There will also be shelter for the HCV operator and perhaps a workshop/tool store. There will be hard-standing to accommodate four stillage assemblies 36, and when the HCV operator returns to the way-station with a fully loaded stillage assembly 36 he will operate an hydraulic jacking mechanism on the HCV to lift the stillage from the base 32 whereafter the HCV operator will extend the legs 37a and lock them in place and then collapse the jacking mechanism so that the base 32 can be driven from beneath the stillage assembly. The operator will drive the base 32 beneath a spare, empty stillage assembly 36, will then operate the jack to lift the stillage assembly to remove the load on the legs, he will release the legs, and then collapse them, finally lowering the jacking

arrangement so that the stillage assembly 36 is carried by the base 32 in readiness for a further collection round.

It will be recognised that the ratio of the dimensions of the compartments of the stillage assembly is similar to the ratio of the dimensions of the boxes of the household collection unit, that is to say is in accordance with the ratio of the proportions of different waste types within the household waste collected.

There will be a number of way-stations distributed around a local authority serviced area and it is anticipated that each way-station will be served by a collection lorry which has storage containers equivalent to the storage containers of the stillage assembly 36. The lorry will transport sorted waste from the way-stations to a recycling depot. Thus each lorry will be equipped with an hydraulic crane or lift arm whereby, at a way-station, it can lift a fully loaded stillage assembly 36 and suspend it over an appropriate container of the lorry. Removable bottom panels of the containers 38, 39 and 40 of the stillage assembly 36 will then be opened in turn, while suspended over the appropriate container of the lorry, to allow the content of the container 38, 39, 40 to fall into the appropriate container of the lorry. The container 41 will be emptied in a similar manner into five separate containers of the lorry, the compartments of the container 41 being opened in turn by operating the hinged compartment partitions, to allow the sorted paper and card from the container 41 to be deposited into the respective containers of the lorry.

The glass container 42 has an openable rear end wall and is discharged into the appropriate three containers of the lorry by positioning the stillage assembly over the containers of the lorry and tipping the container 42 relative to the remainder of the stillage to empty the bottles through the open end wall

into the respective containers on the lorry. Again the different coloured glass is received by different containers or compartments of containers on the lorry. Although the P/OM container 43 of the stillage assembly 36 may be emptied into a container of the lorry, it may be preferable to remove the container 43 from the stillage assembly, by means of sliding it on the roller bed 43a, and to store the container, alongside other similar containers, on the lorry to be emptied, washed and sterilised at the recycling depot. If this method of handling the P/OM is selected then the lorry will also carry empty, cleaned and sterilised containers back to the way-station to replace the containers removed from the stillages.

The dimensions of the containers of the lorry are in a similar ratio to the dimensions of the containers or compartments of the stillage assemblies 36, but are sized to receive a pay load of approximately 15 tonnes. Thus each lorry will be able to collect the pay load of 15 stillage assemblies before it needs to return to the recycling depot.

At the recycling depot the various containers of the lorry are emptied into respective recycling lines. For example, the plastics materials may be sorted by hand with different plastics types being fed by respective conveyors to a container by which the plastics materials are then sent on for reprocessing remotely or in a recycle plant in the depot which, for example, forms reusable plastics pellets from the collected and sorted plastics wastes. The card and paper will be handled in a similar manner and may be supplied to a paper mill in the depot which produces paper sheet from some or all of the collected and sorted paper waste. Glass will be similarly treated and the depot may include glass recycling means producing reusable glass fibre or the like from the collected and sorted glass waste. Food and drinks cans may

need manual, or magnetic sorting to separate them into different metal types, for appropriate recycling. Hazardous materials may need to be disposed of by, for example, combustion as fuel in a combined heat and power unit where they cannot be recycled. Similar comments apply to disposable nappies, and sanitary towels and the like which it is anticipated the householder will collect separately in an appropriately marked bag and for which the HCV operator will arrange special collection, and which will form the main bulk of residual non-recyclable material. Such bags will be handled separately from the remainder of the waste by the HCV operator and by the way-station collection lorry.

Due to legislative requirements and the need for health and safety precautions the recycling depot will include a closed "in-vessel" composting unit, or in order to optimise the benefit from P/OM through benefit from the yield of gas and the better quality and regulation of other products, ideally an anaerobic digester for handling the putrescible and organic material waste. It is anticipated that an anaerobic digester at each recycling depot will process all of the P/OM producing gas which may be burned for heat and power, liquid fertilizer, and soil conditioner both of which can be distributed in the agricultural industry.

It will be recognised that the provision of a household collection unit which permits the householder to sort domestic waste almost as easily as dropping the waste into a single collection bin, provides an initial sorting of the waste which is refined by the single HCV operator as he performs his round. By the time therefore that the waste material reaches the recycling depot, a substantial proportion of the necessary sorting has been accomplished and two major stumbling blocks of achieving high diversion from landfill have

been overcome by facilitating the separation of waste into separate groupings of recyclable materials, and an improvement in the economy of collection by using a single HCV operator to transport waste to a way-station in such a way that it is unnecessary to incur the cost of operating a large compacter truck so that the collection of recyclate ceases to be an additional cost in waste management but instead reduces the overall costs of collection and disposal of domestic waste, typically by about 10% for most local authorities whilst at the same time providing significant environmental improvements.

It is to be recognised that the invention resides in the waste management system, the HCV 31, the compactors, and the collection unit 11, 13, 14, 15, 21, 22, 24, and that each of these may be considered to be inventive in its own right and useable independently of the others.